The synthesis of environmental and economic imperatives popularly called "sustainable development" must become a reality, not just a slogan.

Robert Repetto
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Forum

EMFs and Alzheimer's

Scientists have implicated electromagnetic fields in several types of cancer, particularly leukemia, and have been warning in recent years of the risks of electromagnetic fields (EMFs) to those who work in electrical jobs. Results of two new studies, reported at the Fourth International Conference on Alzheimer's Disease, indicate that EMFs may also play a role in that affliction, which strikes an estimated 4 million Americans a year, and that those at the highest risk are not electrical workers, but dressmakers and tailors.

Kimberly Thigpen

Scary stitches? New evidence shows dressmakers and tailors may be at risk from high levels of EMFs produced by sewing machines.

Eugene Sobel of the University of Southern California School of Medicine reported at the July 31 conference that a joint U.S.-Finnish team has found a strong association between EMF exposures and Alzheimer's disease, including evidence indicating that people with high occupational exposures to EMFs are at least three times as likely to develop Alzheimer's as those with low exposures. Sobel and colleagues also discovered that people in occupations in which they regularly use sewing machines may have the greatest risk of exposure, eclipsing the risk of electric power-line and cable workers. EMFs from industrial and home sewing machines were found to be as much as 200 milliGauss at knee level, although levels were much lower at the operator's head. David Savitz, an epidemiologist at the School of Public Health of the University of North Carolina at Chapel Hill and an expert on electromagnetic fields, cautions that it is not clear that the higher risk for these occupations is a result of higher exposure levels. Said Savitz, "I'm guessing that if you compared time-weighted, whole-body averages [of sewing machine operators] to a variety of electric utility workers, their exposure levels are probably in the same range. It's difficult to compare because different sources [of EMFs] have their own characteristics."

Sobel said that the significant relative risks for Alzheimer's disease are higher than those reported for leukemia and other types of cancer. The studies, which examined three sets of workers—two Finnish and one American—compared the occupational exposure levels of 386 Alzheimer's patients to those of 475 healthy control subjects. Subjects were classified into two exposure levels: medium to high exposure and low or no occupational exposure. The research team found that male workers with the highest exposure levels were three times as likely to develop Alzheimer's. Female subjects were shown to be at even greater risk, 3.8 times the normal risk, of developing the disease.

"This opens up a whole new frontier in terms of potential EMF effects,"said Louis Slesin, editor of *Microwave News,* in an article by the Associated Press. Said Slesin, "EMF has long been a backwater area with a lot of skeptical people taking potshots at the research. This could signal a major change in the way EMF health risks are addressed." Savitz warned that although the studies are certainly interesting, like all new information, they are in need of replication. Said Savitz, "The first link of this sort between a job title and a disease . . . is worthy of trying to refute or corroborate."

Scientists have yet to uncover what triggers Alzheimer's disease, which affects mainly people over 65 years old and causes memory loss, motor impairment, disorientation, personality changes, and eventually loss of bodily functions. Most researchers agree, however, that the cause is a combination of genetic, environmental, and possibly dietary factors.

Flexing Some Mussel

Zebra mussels have been the bane of businesses and boaters since they began infesting the Great Lakes almost six years ago, attaching themselves to boats and clogging water intakes and industrial pipes. Researchers, however, now say that although these zebras can't change their stripes, they may have some usefulness yet, as a yardstick to measure toxins in the environment and as filters of water pollutants.

Donald Lisk, a toxicologist at Cornell University, is working with colleague Edward Mills to develop a system for using zebra mussels to measure the presence of heavy metals, chemical toxins, and radioactive pollutants in the nation's water supply. According to Lisk, the freshwater mollusks are perfectly suited for the job for several reasons: heavy metals such as cadmium, nickel, and lead concentrate in mussel organ and muscle tissue, chemical toxins concentrate in the fatty tissues, and radioactive materials appear in the shell. All three types of pollutants are major environmental health problems in the Great Lakes and other areas. Scientists at the State of the Great Lakes Ecosystem Conference, a joint U.S.–Canadian meeting held in October, reported that hundreds of people still develop cancer every year from eating contaminated fish, accentuating the need for accurate measurement of pollutants.

A characteristic that makes zebra mussels efficient measuring tools is also one reason they have made many enemies: they attach themselves to underwater surfaces and stay there. Although this creates problems for boat owners and water systems, it enables scientists to get a consistent record of the level of contaminants in a given

place. The mollusks, which typically measure about one inch across, are able to filter a liter of water a day. In a recent article Lisk said, "They're quite effective at filtering water and concentrating poisons. So what you have is a monitor that sits there and tells you what's happening."

Scientists at the Center for Great Lakes Studies and the University of Wisconsin in Milwaukee are excited about the mollusks' filtering abilities for another reason. In a laboratory experiment using zebra mussels to form a filter, the mussels reduced quantities of cryptosporidium by more than 95%. (Crytosporidium is a parasite that made hundreds of people sick last year when it contaminated Milwaukee's water system.) The zebra mussels also reduced coliform bacteria by 69%, most other bacteria in the water by 75%, and removed almost all particulate matter. Although the scientists conducting the experiment envision using full-scale zebra mussel filters at municipal water plants, there are currently no plans to implement the idea.

The environmental benefit of zebra mussels, however, may not outweigh the harm they cause to water systems, and the mollusks may inadvertently cause the introduction of even more contaminants to water supplies. Environmental officials estimate that the rapid spread of zebra mussels will cause up to $5 billion in property damage. Worse than that, say some, is the fact that currently the only effective means of controlling zebra mussels is to add chlorine or other chemicals into the pipes to kill the larvae before they attach, thereby introducing a new set of health concerns into the picture. Still, adds Lisk optimistically, until someone figures out a way to get rid of zebra mussels, we might as well make productive use of them.

Turning over a New Leaf

Reviled by doctors as the killer crop, targeted by antismoking activists, and investigated by Congress and the FDA for potential drug regulation, tobacco has become a popular nemesis in the past few years. New experiments suggest, however, that tobacco's nasty reputation may be cleaned up if the plant's promise as a medicine producer is fulfilled.

Although many of the almost 4,000 chemicals in tobacco are dangerous, others have beneficial or commercial use. For instance, scientists at North Carolina State University, in the country's top tobacco-producing state, are using tobacco plants to produce fraction-1, a protein produced by all green vegetables, but made in higher concentrations in tobacco. Although the first application of the gelatinous substance will probably be in cosmetics, researchers hope the protein may have potential as a nonallergenic infant formula or as an ultrapure food for kidney patients that may help them to avoid dialysis.

What has scientists truly excited about tobacco, however, is not so much the substances the plant produces naturally, but the medicines it may be engineered to make in the future, including blood thinners and possibly a drug to battle AIDS. Tobacco grows foreign genes so easily that scientists hope it may one day replace expensive transgenic animals and bacterial systems now being engineered to produce human proteins. "Tobacco is like the white mouse of the plant world," said Bob Erwin, president of BioSource Genetics, a new company investigating pharmaceutical tobacco, in an article by the Associated Press. Erwin has infected plants with transgenic viruses to produce a molecule called alpha-trichosanthin, which is being tested as a possible AIDS drug. The hope is that the plants will synthesize the substance in far greater amounts than humans synthesize it, making the drug more accessible and less expensive.

Plant pathologist Carole Cramer and colleague Deb Weissenborn of Virginia Technical Institute are conducting field trials at the Southern Piedmont Agricultural Experiment Station in Blackstone, Virginia, on tobacco plants bioengineered

Thomas O'Keefe/Cornell Biological Field Station

Changing its stripes. Scientists are developing positive uses for zebra mussels.